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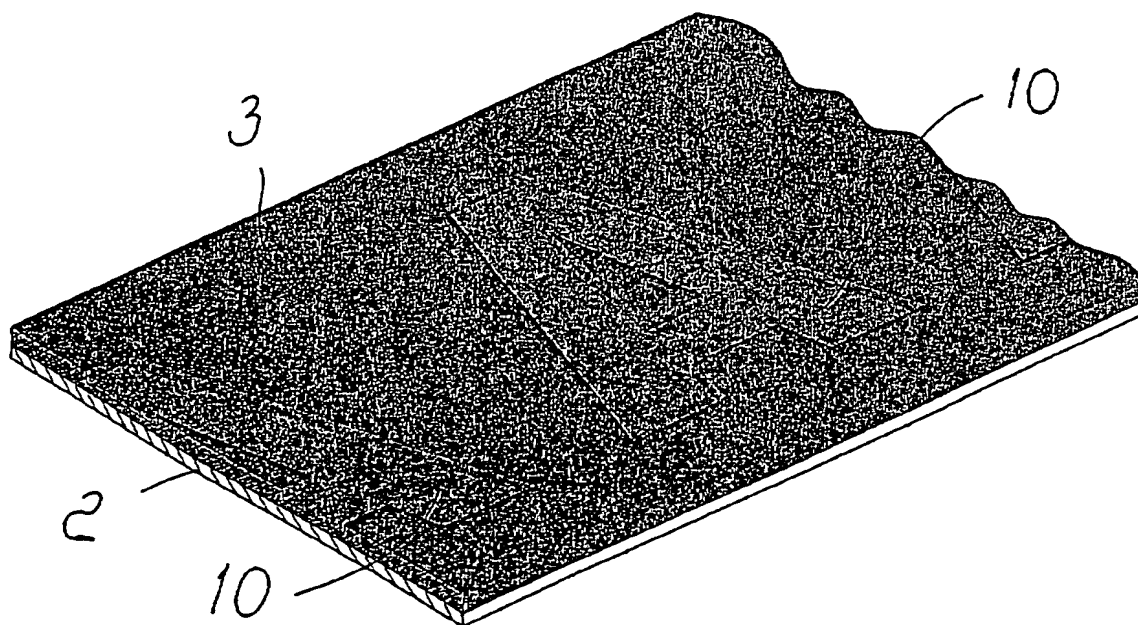
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- (71) Applicant (for all designated States except US): MAN-
TEGAZZA ANTONIO ART GRAFICHI S.R.L.
[IT/IT]; Via Milano, 71, I-20021 Bollate (Milano) (IT).
- (72) Inventor; and
- (75) Inventor/Applicant (for US only): LAZZERINI, Mau-
rizio [IT/IT]; c/o MANTEGAZZA ANTONIO ART
GRAFICHI S.R.L., Via Milano, 71, I-20021 Bollate
(Milano) (IT).
- (74) Agents: LESON, Thomas, Johannes, Alois et al.; TBK-
Patent, Bavariaring 4-6, 80336 München (DE).
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(54) Title: SECURITY ELEMENT FOR DOCUMENTS IN GENERAL AND IN PARTICULAR BANKNOTES, SECURITY CARDS AND THE LIKE



(57) Abstract: Security element (1) for documents in general, in particular banknotes, security cards and the like, comprising a support layer (2) having, at least on one face, a continuous layer of metallic material (3), wherein said continuous layer of metallic material (3) comprises at least one zone (10) having a reduced thickness of metal with respect to surrounding portions so as to be visually distinctive from the surrounding portions or vice versa.

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Security element for documents in general and in particular banknotes,
security cards and the like

The present invention relates to a security element for documents in general and in particular banknotes, security cards
5 and the like.

As it is known, in order to avoid the counterfeiting of banknotes and documents in general, a presently very used technique consists in arranging some threads which can be
10 inserted into the mixture of the paper of which the document is made, said threads being wholly inserted or partially fitted-in the paper, that is, having some parts inside and some parts outside of the paper.

15 Typically, these threads are made of a support layer of flexible and transparent plastic material upon which metallic layers, magnetic elements, microprintings, fluorescent elements, magnetic codes and so on are deposited.

20 To also allow the public and the common users to verify the authenticity of the documents, threads have been developed which allow the immediate and easy determination of the authenticity of the threads, together with the possibility to carry out the control through automatic devices which are suitably arranged
25 for this purpose.

One of these threads is illustrated in the European patent EP-0 319 157 which is substantially made of a layer of transparent and flexible plastic material upon which a vacuum-deposited
30 aluminium layer is applied, upon which some zones, areas, texts or graphic signs are realised by means of demetallization that creates some zones without the metal, but they are entirely surrounded by metal that allows to keep the metallic continuity of the thread.

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This present kind of solution results in easily falsificating because it is possible to utilise transfer materials like materials which are printable on support which can be removed and positioned on other supports by means of the use of particularly precise dies manufactured by laser techniques.

Furthermore, another easy possibility of counterfeiting derives from the use of usual polyester sheets metallized under vacuum, that are available on the market, from which the aluminium can be removed, for example, by means of an Nd-Yag laser ray with a wavelength around 100 nm that is with an equipment which is easily available.

Another problem is constituted by the fact that in the solution described above, the different graphic signs are obtained by realising a complete removal of the metal, thereby causing in some cases, during the phase of lengthening of the threads which inevitably occurs at the time of its insertion into the paper, a break of the metallic layer around the cut zones which can strongly compromise the metallic continuity of the ensemble.

Another problem is constituted by the fact that, at the time of the insertion of the thread into the paper, the thread is submitted to an acid environment or anyway aggressive agent which determines some corrosion especially in the zones of the corners which are obtained by demetallizing completely the thread.

This fact causes both a degradation during the service-life of the product, and a possible difficulty in reading and checking of the thread or security element.

The object of the present invention is to eliminate the formerly described drawbacks, realising a security element for documents in general and in particular banknotes, security cards and the like, which gives the possibility to create an ensemble which is

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not reproducible with traditional techniques and, consequently, disposable by the possible counterfeiter.

5 Within the object described above, a particular object of the invention is to manufacture a security element which does not eliminate the metallic continuity on the whole surface of the support layer, thereby preventing any possible break, for example at the time of lengthening of the thread for the insertion into the paper, thereby maintaining in any condition
10 the metallic continuity which is necessary for the detection of the security element by means of a reading equipment.

A further object of the present invention is to manufacture a security element which is not subject to damage also in the case
15 in which it is attacked in an acid environment, which is the typical environment at the time of the insertion of the thread into the paper, thereby maintaining constant its integrity in time.

20 A further object of the present invention is to manufacture a security element which is applicable externally to the document, thereby creating a feature easily perceptible by the public.

The above object, as well as the further objects briefly
25 mentioned and others which will be apparent in the following, are achieved by a security element for documents in general and in particular banknotes, security cards and the like according to the invention which comprises a flexible support layer having, on at least one of its faces, a layer of metallic
30 material, characterised in that said layer of metallic material comprises at least one zone having a metal thickness lower than 60% of the thickness of the layer of metallic material of the surrounding portions.

35 Further characteristics and advantages will become apparent from the description of one preferred embodiment, but not exclusive,

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of a security element for documents in general and in particular banknotes, illustrated by purely a non limitative example, with reference to the attached drawings in which:

5 - figure 1 schematically shows the security element according to the invention;

- figure 2 represents the security element in an greatly enlarged scale and in cross-section;

10 - figure 3 represents the security element according to the invention inserted into a document;

15 - figure 4 represents the security element applied on the external face of the document.

With reference to the drawings, the security element for documents in general and in particular banknotes, security cards and the like according to the invention, which is indicated in
20 its entirety with the reference number 1, comprises a flexible support layer 2 which is advantageously obtained by polyester sheets and the like.

On the support layer 2, upon one face but possibly also on both
25 faces, a layer of metallic material 3 is provided, wherein the important peculiarity are zones, indicated with 10, which have a reduced thickness of the metal with respect to the surrounding zones and which is preferably, lower than 70% and greater than
30 25% of the thickness of the layer of metallic material of the surrounding portions; hence, with a thickness of the layer of 1,8 Optical Density, the zones of reduced thickness must have a thickness comprised between 0.45 and 1.26 Optical Density.

In this way the metallic continuity is maintained on the whole
35 surface of the support layer, and the distinctive elements which can be constituted by characters, graphical signs and anything

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else which can be considered as being suitable, are defined in practise by said zones having reduced thickness of the metal.

5 The metallic layer can be obtained of aluminium being metallized under vacuum or other metal like chrome, nickel, copper or a combination of these materials.

10 The partial removal allows to maintain the metallic continuity having as well a different amount of metal among the zones where the partial removal has been effected which allows to keep an element visually verifiable.

15 The support layer can be made of a tape, as shown in the specific example, but, obviously, it can assume any other configuration as thread, stamp or any other configuration which is deemed to be suitable.

20 The security element manufactured, as disclosed above, can either be wholly inserted into the paper of which the document is made, or partially inserted, that is, having some part that come out of the surface, or directly applied on the surface like schematically illustrated in figure 4.

25 In a specific embodiment, the support layer is made of 15, 19 or 23 μm polyester which is metallized on its side by means of a vacuum metallizer, which deposits an aluminium layer of 1.8 Optical Density.

30 A cleaner film can be obtained by plasma treatment which allows a better and more uniform adhesion.

35 Preferably, the speed of application must not be more than 400-500 metres per minute, and a metallizer should be used having an advancing system for each aluminium thread and a system of automatic detection of metallization, so that a surface with a maximum variation of thickness lower than 3% is obtained.

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The tape treated as disclosed above is inserted into a chemical action demetallization device, possibly with the use of an acid.

- 5 To perform the treatment, the metallic layer is previously submitted to a corona treatment which allows to simplify the anchoring of an ink which is used.

10 Above the aluminium layer, a very transparent ink adapted to preserve the aluminium by the attacks of acid substances is printed with normal operations of printing, these inks are, for example, nitrocellulosic inks with the addition of a catalyst or anyway of a hardener with a percentage of 1%.

- 15 Some tanks containing the chemical products for the demetallization of the tape and a subsequent washing and drying system are provided.

20 A suitable method implies the metallization of a 23 μm polyester film with 1.8 Optical Density of aluminium $\pm 3\%$, subsequently a corona treatment is performed on the metallic layer, thereby providing a superficial wettability of 54 ± 4 dynes, subsequently the metallic layer is printed with an ink for metals, for example nitrocellulosic ink with a thickness of 1.2
25 - 2 μm .

The film is then passed in a tank containing 47-48% phosphoric acid with a temperature of 40°C ± 2 for about 40 - 45 seconds.

- 30 The film is washed in a tank using water, and at the exit of the tank, the film is dipped in a tank with a buffer solution made of water and 3/5 % ammonia.

Afterwards the treated film is submitted to an abundant rinse,
35 keeping the pH value in each tank constant.

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At the exit of the last tank, the film is submitted to a gentle wringing by means of rubber rollers, and then it is passed in a hot air tunnel at the speed of 40 metres per minute and a hood temperature of about 90/100° C; the tunnel has a length of about 6 metres in such way to obtain a permanence time of about 10 seconds.

The method described above allows to obtain security threads on which the deposited aluminium has been partially removed from 1.8 Optical Density to 0.7 Optical Density in the zones in which the ink has not been applied.

Another possible solution to obtain the security element according to the invention consists in carrying out the complete demetallization in the zones where the characters, distinctive signs and the like must be printed, which is indicated by 10, and to apply afterwards a thickness of metal with a thickness lower than the thickness of the surrounding zones.

In practise, a 23 µm polyester film is metallized with 1.8 Optical Density +/- 0.3%, and subsequently, as in the previous case, corona treatment is carried out bringing the superficially wettability to 54 +/- 4 dynes, and the print is carried out on the side of the metallic layer with cellulosic inks for a thickness of 1.2 - 2 µm. The film thus obtained is passed in a tank which contains 54/56 % phosphoric acid with a temperature of 55°C degrees +/- 2 with a permanence time of about 50 - 55 seconds.

The film is then washed in a tank using water and afterwards, in another tank, it is dipped into a buffer solution with water and 3/5 % ammonia.

After an abundant rinse, the film is submitted to spraying and drying like in the previous example.

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The film is subsequently submitted again to a full bottom metallization operation preferably with a thickness of 0.7 Optical Density.

- 5 The metallic layer can be possibly applied also on the opposite face.

From what is illustrated above, it can be seen that the invention reaches the proposed objects, and in particular it has
10 been pointed out that a security element is provided which maintains a superficial metallic continuity which renders very complex counterfeiting, in addition to improving the mechanical and chemical characteristics of the ensemble by the fact that the metallic continuity prevents, in particular in the zones
15 where the signs and distinctive characters are defined, successive breaks from occurring during the treatment phases.

The invention so conceived is susceptible of various changes and modifications all within the scope of the present invention.

20 To what illustrated above, it must be added that the ratio between the surfaces with reduced thickness and the surfaces with total thickness could be changed, so that it is possible to define the visually detectable characters by full thickness
25 zones.

The embodiments provided with their individual characteristics disclosed in connection with specific examples in practice can be interchanged with other different characteristics provided in
30 the other embodiments.

Furthermore, it is understood that anything what will appear to be part of the prior art during the examining procedure of this patent application is hereby disclaimed and removed from the
35 claims.

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In practice, the used materials, as well as the dimensions and the forms could be varied according to the different needs.

5 In particular, the metallic layer 3 may be made of a noble metal, aluminium, chrome, nickel, copper or a combination thereof. Preferably, the noble metal is gold.

CLAIMS

1. Security element (1) for documents in general, in particular banknotes, security cards and the like, comprising a support
5 layer (2) having, at least on one face, a continuous layer of metallic material (3), characterised in that said continuous layer of metallic material (3) comprises at least one zone (10) having a reduced thickness of metal with respect to surrounding portions so as to be visually distinctive from the surrounding
10 portions or vice versa.
2. Security element (1) according to claim 1, characterised in that said at least one zone (10) has a thickness of metal lower than 70% and greater than 25% of the thickness of the layer of
15 metallic material (3) of the surrounding portions.
3. Security element (1) according to any one of the previous claims, characterised in that said metallic layer (3) is made of a noble metal, aluminium, chrome, nickel, copper or a
20 combination thereof.
4. Security element (1) according to claim 3, characterised in that said noble metal is gold.
- 25 5. Security element (1) according to one or more of the previous claims, characterised in that said metallic layer (3) has a thickness lower than 2.2 Optical Density.
6. Method for manufacturing a security element (1) for documents
30 in general and in particular banknotes, security cards and the like according to claim 1, characterised in that the method comprises the steps of
metallizing at least one face of a polyester support layer
(2),
35 applying a printed layer of ink thereon to protect said metallic layer (3),

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demetallizing the tape in a tank containing 47-48% phosphoric acid with a temperature of 40°C +/- 2 for a period of 40-45 seconds,

washing with a buffer solution made of water and ammonia,

5 and

rinsing the obtained product.

7. Method according to previous claim, characterised in that the method comprises steps of drying the film by means of wringing
10 and of passing it in a hot air tunnel with a speed of 40 meters per minute at a temperature of 90-100°C with a permanence time of substantially 10 seconds.

8. Method according to the previous claims, characterised by a
15 step of providing a corona treatment on the metallic layer (3) for anchoring the ink to be printed.

9. Method for manufacturing a security element (1) for documents in general and in particular banknotes, security cards and the
20 like, characterised in that the method comprises the steps of metallizing a polyester support layer (2), carrying out on the produced metallic layer (3) a printing with cellulosic inks, carrying out a demetallization with 54-56% phosphoric acid
25 at a temperature of 55°C +/- 2 for a time of 50-55 seconds, washing the obtained product with water and ammonia, rinsing, and applying by means of an operation of a full bottom metallization a metallic layer with a thickness lower than the
30 already present layer.

10. Document in general, characterised in that it comprises a wholly inserted security element (1) according to the previous claims.

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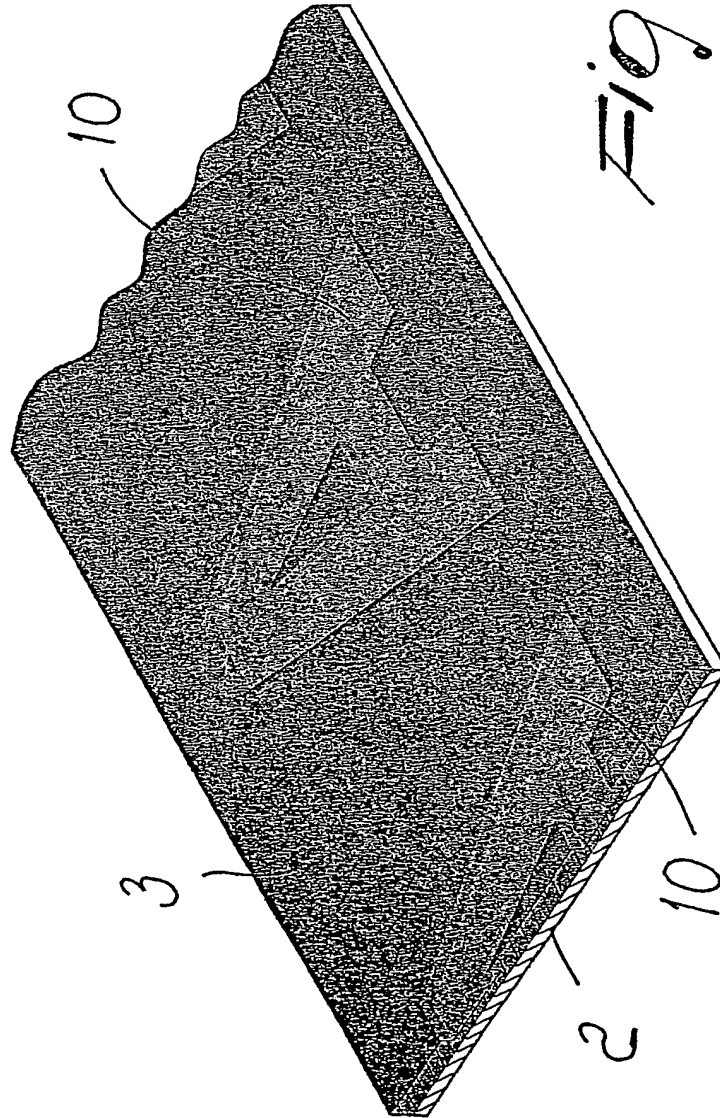
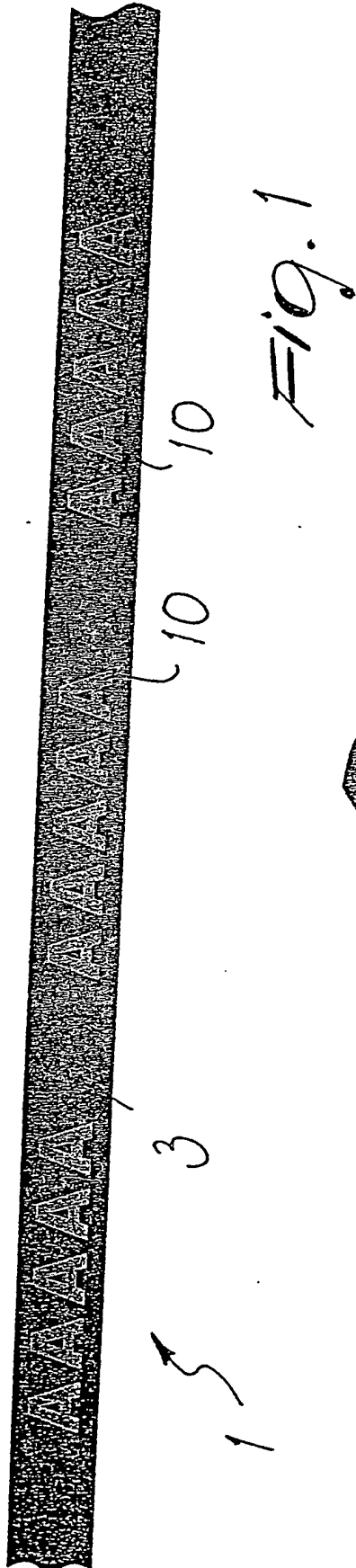
11. Document in general according to one or more of the previous claims, characterised in that it comprises at least one partially inserted security element (1) according to the previous claims.

5

12. Document in general, characterised in that it is provided on one of its external faces with a security element (1) according to the previous claims.

10 13. Security element (1) according to claim 1, characterised in that also the layer of metallic material (3) in the at least one zone (10) having the reduced layer thickness is continuously formed.

15 14. Security element (1) according to one or more of the previous claims, characterised in that the support layer (2) is flexible.



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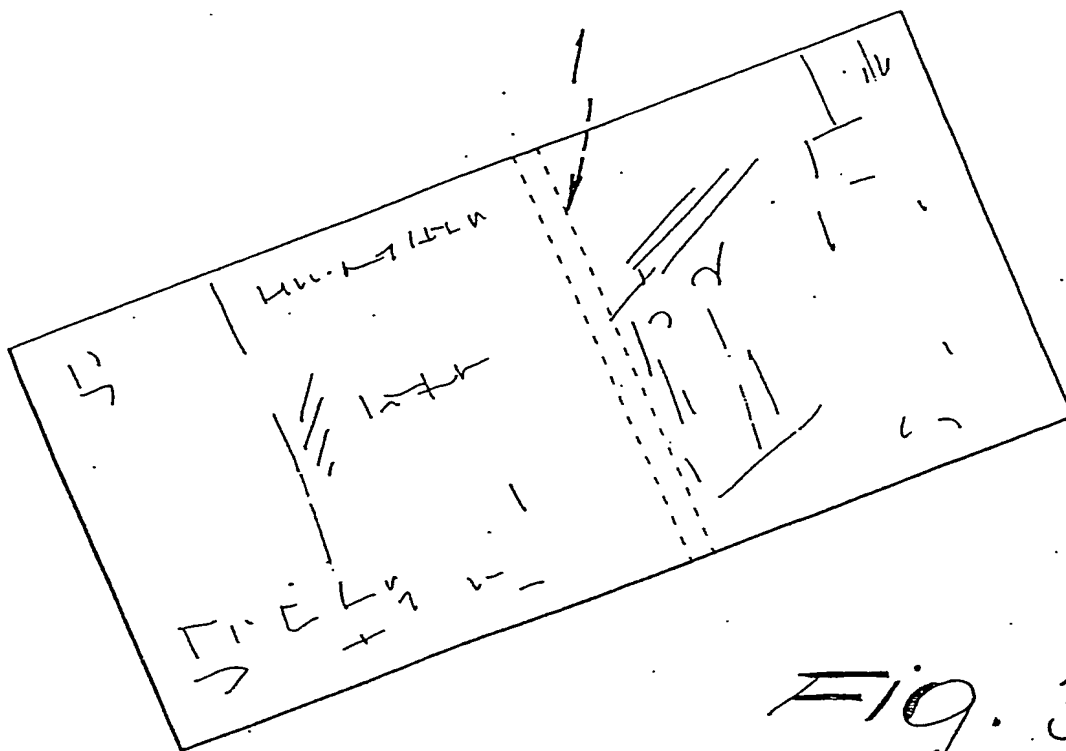


Fig. 3

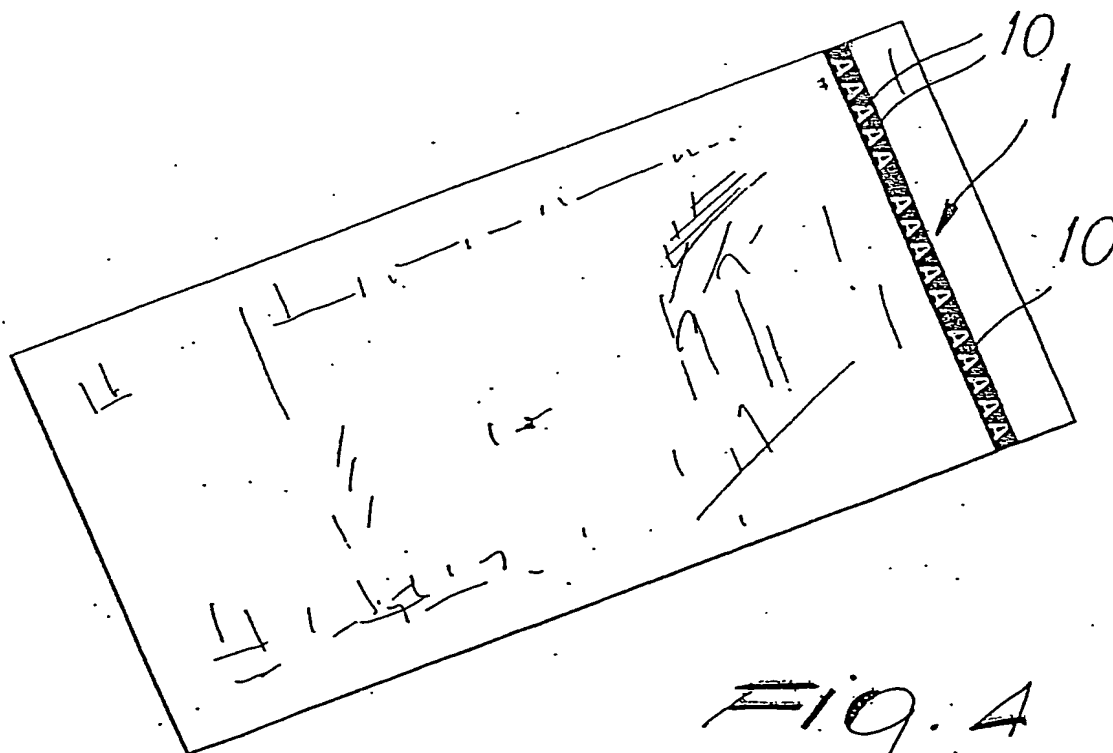


Fig. 4

INTERNATIONAL SEARCH REPORT

PCT/EP 02/11177

A. CLASSIFICATION OF SUBJECT MATTER
IPC 7 B42D15/10

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)
IPC 7 B42D

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practical, search terms used)
EPO-Internal, WPI Data, PAJ

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category *	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	EP 0 319 157 A (PORTALS LTD) 7 June 1989 (1989-06-07) cited in the application the whole document	1,6,9
A	WO 97 19820 A (LANDIS & GYR TECH INNOVAT ;STAUB RENE (CH); TOMPKIN WAYNE ROBERT () 5 June 1997 (1997-06-05) the whole document	1,6,9

☐ Further documents are listed in the continuation of box C.

☒ Patent family members are listed in annex.

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- *E* earlier document but published on or after the international filing date
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- * & * document member of the same patent family

Date of the actual completion of the international search

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Name and mailing address of the ISA
European Patent Office, P.B. 5818 Patentlaan 2
NL - 2280 HV Rijswijk
Tel. (+31-70) 340-2040, Tx. 31 651 epo nl,
Fax: (+31-70) 340-3016

Authorized officer

Louvion, B

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INTERNATIONAL SEARCH REPORT

International Application No

PCT/EP 02/11177

Patent document cited in search report		Publication date	Patent family member(s)	Publication date
EP 0319157	A	07-06-1989	AU 606766 B2	14-02-1991
			AU 2512888 A	08-06-1989
			BR 8806353 A	22-08-1989
			CA 1316958 C	27-04-1993
			CN 1034079 A ,B	19-07-1989
			DE 3840557 A1	15-06-1989
			DK 674388 A	05-06-1989
			EP 0319157 A2	07-06-1989
			ES 2029971 T1	16-10-1992
			FI 885642 A ,B,	05-06-1989
			GB 2213098 A ,B	09-08-1989
			IN 173621 A1	18-06-1994
			JP 2006694 A	10-01-1990
			JP 7062320 B	05-07-1995
			KR 9612523 B1	20-09-1996
			MX 170050 B	05-08-1993
			PH 27431 A	21-06-1993
			US 4943093 A	24-07-1990
			YU 215388 A1	30-06-1991
WO 9719820	A	05-06-1997	CH 691750 A5	28-09-2001
			CH 690529 A5	29-09-2000
			AT 215887 T	15-04-2002
			AU 7624496 A	19-06-1997
			CA 2238384 A1	05-06-1997
			DE 69620636 D1	16-05-2002
			DE 69620636 T2	21-11-2002
			WO 9719820 A1	05-06-1997
			EP 1182054 A2	27-02-2002
			EP 1182055 A2	27-02-2002
			EP 0871574 A1	21-10-1998
			ES 2171747 T3	16-09-2002

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